

# **Improvement of the production of poly(3-hydroxybutyrate-co-3-hydroxyvalerate-co-4-hydroxybutyrate) terpolyester by manipulating the culture condition**

## **Abstract**

**BACKGROUND:** The aim of this work is to enhance the production of terpolyester poly(3-hydroxybutyrate-co-3-hydroxyvalerate-co-4-hydroxybutyrate) (P(3HB-co-3HV-co-4HB)) produced by a locally isolated bacterium, *Cupriavidus* sp. USMAA2-4. The monomer composition was varied by supplementing different carbon precursors and by manipulating the culture condition through one-stage cultivation. The effect of C/N ratio and different concentrations of carbon source and precursors were investigated in order to produce higher content of this terpolyester. Although research on this biodegradable polyester is abundant, studies on terpolyester P(3HB-co-3HV-co-4HB) are still limited.

**RESULTS:** Supplementation of oleic acid in accumulation medium increased the bacterial growth and polyhydroxyalkanoate (PHA) accumulation. It was also shown that medium consisting of assorted carbon precursors at C/N 20 gave relatively high dry cell weight and P(3HB-co-3HV-co-4HB) content. Various compositions of terpolyester were obtained when the concentration of oleic acid and 4HB precursors were manipulated. The combination of oleic acid with  $\gamma$ -butyrolactone and 1-pentanol was found to be the best combination to produce high PHA content (81 wt%). The composition of monomer in P(3HB-co-3HV-co-4HB) was produced in the range 8-13 mol% for 3HV and 9-24 mol% for 4HB, respectively.

**CONCLUSIONS:** The production of P(3HB-co-3HV-co-4HB) in shake-flasks successfully produced 81 wt% of PHA content. This manipulated culture condition can be used at larger scale to provide modeling for the production of terpolyester in a bioreactor.